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A study to compare three airway devices in relation to their effects on IOP and haemodynamic changes in anaesthetized patients

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Abstract

The study was conducted in 120 patients aged 15-60 yrs. of ASA grades I and II undergoing non-ophthalmic surgeries requiring general anaesthesia. Patients were randomly allocated into I-GEL, C-LMA and ETT groups. Each group contained 40 patients. The climb in IOP after incorporation of contraption was progressively conspicuous for the tracheal chamber intubation group (18.33+1.92 in right eye and 18.54+2.0 in left eye) than for the LMA group (13.15+1.85 in right eye and 13.12+1.61 in left eye) and I-GEL pack where there was no rising in any way shape or form (11.86+1.61 in right eye and 11.72+1.60 in left eye). The climb in HR after incorporation of device was generally raised in ETT group (99.2±8.39) trailed by C-LMA group (87.75±10.35) and fundamentally no rising in I-GEL group (81.4+11.81). The climb in SBP after consideration of contraption stood out from after acknowledgment regards (108.1+9.71, 107.17+9.14, 108.05+7.23 for I-GEL, C-LMA and ETT exclusively) was generally raised in ETT group (130.57±8.16) trailed by old style LMA group (117.95±7.39) (which didn't rise above pre enrollment regard) and essentially no rising in IGEL group (108.77+9.10). The climb in DBP after consideration of contraption appeared differently in relation to after selection regards (69.22+9.82, 66.87+9.65, 69.12+9.72 for I-GEL, C-LMA and ETT independently) was generally raised in ETT group (84.52±11.78) trailed by LMA group (79.27±7.31) (which didn't rise above pre acknowledgment regard) and for all intents and purposes no rising in I-GEL group (69.8+10.01). Hence it was concluded that i-gel insertion produced the least rise in intraocular pressure and haemodynamic response as compared to laryngeal mask airway and tracheal intubation.

Keywords- *Intraocular Pressure, Hemodynamics, Classical Laryngeal Mask Airway, Endotracheal tube*

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I. INTRODUCTION

In normotensive patients laryngoscopy and insertion of an endotracheal tube is immediately followed by an average increase of mean arterial pressure of 25 mm Hg. There is no evidence that this effect causes lasting damage in normotensive patients [Forbes et al., 1970]. After intubation there is an increase in heart rate and blood pressure. This reflects the stress response associated with tracheal intubation. As the eye is an essential organ, this is associated with increased blood flow to this area and thus an increase in IOP[Robinson et al., 1991].

Notwithstanding colossal advances in contemporary narcotic practice, advances in flight course the load up continues being of imperative noteworthiness to anaesthesiologists. Laryngoscopy and endotracheal intubation is the commonest technique for ensuring about a decisive aeronautics course for coordinating sedation. In any case it is connected with tachycardia and hypertension1 and an extension in intraocular pressure [Watcha et al., 1992, Wynands et al., 1960]. These movements have been believed to be connected with extended catecholamine levels insisting a pervasively insightful response to it[Prys-Roberts et al., 1973]. The climb in IOP may be discretionary to extended attentive development causing vasoconstriction and an extension in central venous weight which has a closer relationship with intraocular pressure than primary vein pressure [Bukhari et al., 2003]. Transient hypertension and tachycardia are of no result in sound individuals, anyway either or both may be hazardous to the patients with hypertension, myocardial lack or cerebrovascular disease. The risky traps that can happen due to this response are ventricular tachycardia, extreme left ventricular frustration, myocardial ischaemia and cerebrovascular disasters. The climb in intraocular pressure during laryngoscopy and intubation includes stress in patients of extreme glaucoma and open eye wounds where even little augmentation in intraocular pressure proceeded for a short period of time may change what is fundamental hover perfusion into plate ischaemia and removal of the substance of the eye ball with possible resultant visual hindrance [Bukhari et al., 2003]. The wide collection of flight course devices available today may broadly be named intraglottic and extraglottic flying course devices, which are used to guarantee the aeronautics course in both elective similarly as emergency conditions [Helmy et al., 2010; Sood, 2005].

Supraglottic avionics course contraptions are as of now comprehensively used for clinical strategy requiring general sedation, so as to avoid the complexities related with tracheal intubation [Richez et al., 2008]. The supraglottic flight course contraption is a novel device that fills the opening in aeronautics course the load up between tracheal intubation and use of face shroud. Dr Archie Brain, a British anaesthesiologist, on the grounds that introduced the laryngeal spread flying course in 1983, proposed to be arranged around the laryngeal delta that could overcome the complexities related with endotracheal intubation, in any case, be essential and atraumatic to insert [Pennant et al., 1993] . Laryngeal cover flight course is a supraglottic aeronautics course device with an inflatable sleeve molding a low weight seal around the laryngeal delta and permitting ventilation [Pennant et al., 1993]. The laryngeal spread flight course has been settled in for more than 10 years and is routinely used when endotracheal intubation isn't generally required [Helmy et al., 2010; Weiler, 1997]. Careful recognitions and clinical experience have provoked a couple of refinements of Brain's one of a kind model inciting improvement of progressively current supraglottic aeronautics course devices with better features for flying course support. 9 As time went on, additional devices were added to the LMA family to satisfy unequivocal necessities, and different various devices were made. There are

innumerable supraglottic avionics course contraptions, some of which appear the LMA family and others that work under a substitute thought [Bein et al., 2005]. I-gel is the single use supraglottic avionics course from intersurgical, UK [Hagberg et al., 2015] with an anatomically organized spread made of a gel like thermoplastic elastomer. It has features planned to confine the gastrointestinal and respiratory tracts and grant a gastric chamber to be passed into the stomach. The flexible properties of the I-gel bowl, close by its shape and the edge at its proximal end, add to the robustness of the device upon consideration. In the wake of sliding underneath the pharyngo-epiglottic folds, it decreases and that's only the tip of the iceberg, making an outward force against the tissues. The edge at the proximal bowl gets the base of the tongue, moreover protecting the contraption from moving upward out of position (and the tip from moving out of the upper throat) [Levitan et al., 2005]. It is expected to achieve a mirror impression of pharyngeal and laryngeal structures and to give a perilaryngeal seal without sleeve growing. A channel tube is put even to the flight course tube, which licenses consideration of gastric chamber [Richez et al., 2008]. It has the potential central focuses including less complex expansion, irrelevant threat of tissue pressure, constancy after consideration and an inbuilt eat square [Kannaujia et al., 2009]. Very few studies have been done to compare the intraocular pressure rise and haemodynamic response difference between the two supra glottis airway devices namely i-gel and LMA and the conventional ETT. Hence, this study was undertaken to compare these three airway devices in relation to their effects on IOP and haemodynamic changes in anaesthetised, paralyzed adult patients posted for elective surgeries under general anaesthesia.

II. MATERIALS AND METHODS

Source of data: The study was conducted at Krishna hospital, Karad on patients undergoing elective non ophthalmic surgical procedures requiring general anaesthesia during the period of two years.

Design of the study : Prospective randomized clinical trial.

Premedication They were kept nil orally 10 pm onwards on the previous night. Patients of all three groups were premeditated with tablet Diazepam 10mg on previous night of surgery. Method of collection of data: From previous literature for the mean difference of 4.2 mmHg intraocular pressure and for alpha value of 0.01 and power 80%, sample size calculated is minimum 17 per group. But however we will include 40 samples in each group.

Study subjects- A total of 120 patients will be taken for the study. Three groups will be formed of 40 cases each.

Technique

The patient was shifted to operation theatre table, intravenous access of 20 G cannula was secured. Injection metoclopramide 10mg and injection ranitidine 50mg were given intravenously before surgery. Standard monitors like non-invasive measurements, EtCO2, continuous ECG monitoring and pulse oximetry were attached to the patient. The baseline systolic, diastolic blood pressure, SpO2, and heart rate were recorded. The baseline intraocular pressure was also recorded with the use of Schoitz tonometer after instilling two drops of 4% lidocaine in each eye.

III. OBSERVATIONS AND RESULTS

The ascent in IOP after inclusion of gadget was more noteworthy for the tracheal cylinder intubation group (18.33+1.92 in right eye and 18.54+2.0 in left eye) than for the LMA group (13.15+1.85 in right eye and 13.12+1.61 in left eye) and I-GEL bunch where there was no ascent by any stretch of the imagination (11.86+1.61 in right eye and 11.72+1.60 in left eye).

The ascent in HR after addition of gadget was most noteworthy in ETT group (99.2±8.39) trailed by C-LMA group (87.75±10.35) and basically no ascent in I-GEL group (81.4+11.81)

The ascent in SBP after addition of gadget contrasted with after enlistment esteems (108.1+9.71, 107.17+9.14, 108.05+7.23 for I-GEL, C-LMA and ETT separately) was most noteworthy in ETT group (130.57±8.16) trailed by old style LMA group (117.95±7.39) (which didn't transcend pre acceptance esteem) and basically no ascent in IGEL group (108.77+9.10) .

The ascent in DBP after addition of gadget contrasted with after enlistment esteems (69.22+9.82, 66.87+9.65, 69.12+9.72 for I-GEL, C-LMA and ETT individually) was most noteworthy in ETT group (84.52±11.78) trailed by LMA group (79.27±7.31) (which didn't transcend pre acceptance esteem) and basically no ascent in I-GEL group (69.8+10.01).

IV. DISCUSSION

Present assessment reveals that the extension in intraocular weight, beat and circulatory strain after incorporation of an avionics course device, stood out from the measure regards was least after I-GEL use in connection with old style LMA and conventional tracheal chamber intubation. Laryngoscopy and tracheal intubation, to achieve flight course control in sedation practice, have been dependably aggravating anaesthesiologists concerning common occasion of the pressor responses related with it. The haemodynamic responses, appearing as addition in beat and circulatory strain, are a direct result of reflex sympathoadrenal discharge instigated by epilaryngeal and laryngotracheal actuation following to laryngoscopy and tracheal intubation [Ghai et al., 1973]. The weight response to tracheal intubation and extubation is in like manner associated with increase in IOP [Robinson et al., 1991]. Among the components affecting the intraocular pressure, changes in the central vein circulatory strain have the most diminished monstrosity inferable from expulsion of liquid from the front chamber, which is equilibrated by a move of blood from the choroidal vessels [Kaskel et al., 1974]. A prompt and close association exists between the central venous weight and intraocular pressure, and the rising in central venous weight realized by hacking is immediately transmitted to the eye by preventing the efflux of watery. 56 Laryngoscopy and intubation, as showed up in this assessment, in like manner have a huge activity in raising intraocular pressure, maybe due to the mindfully interceded vasoconstriction making extended venous return and an unforeseen rising in central venous weight [Drenger et al., 1985]. The serious addition in IOP may be perilous for patients with drawing closer puncturing of eye, puncturing eye wounds, glaucoma, etc. This issue has drawn the thought of various workers to ponder the debilitating of these

responses with some pretreatment or by some choice to laryngoscopy and tracheal intubation viz. LMA. Lignocaine pre-treatment either intravenous or nebulised, has been utilized to diminish visual and essential reactions to laryngoscopy and tracheal intubation. [Murphy, 1985], LMA, as a choice to endotracheal tube has pulled in the thought of various pros concerning IOP changes, as it blocks the prerequisite for laryngoscopy and tracheal intubation. Holden et al[Holden et al., 1991] were the first to consider the IOP changes using LMA and endotracheal tube and their discernments similarly as those of [Holden et al., 1991] revealed a basically humbler addition in IOP using LMA both on course of action and departure when appeared differently in relation to endotracheal intubation. Relative results were represented by Duman [Duman et al., 2001]. The I-gel is another supraglottic contraption, without an inflatable sleeve, planned for use during sedation [Levitan et al., 2005]. It is a latex free, unnecessary contraption, made of a clinical assessment thermoplastic elastomer. I-gel is anatomically preformed to mirror the perilaryngeal structures. The contraption contains an epiglottis blocker, which helps with keeping epiglottis from down falling or hindering laryngeal delta. The fragile non-inflatable sleeve seals anatomically against perilaryngeal structures [Helmy et al., 2010]. In our assessment the standard IOP, HR, SBP and DBP values were proportionate among all the social occasions with no basic differentiation between them. The rising in IOP after consideration of device was progressively noticeable for the tracheal chamber intubation group (18.33+1.92 in right eye and 18.54+2.0 in left eye) than for the LMA group (13.15+1.85 in right eye and 13.12+1.61 in left eye) and I-GEL bundle where there was no climb in any way shape or form (11.86+1.61 in right eye and 11.72+1.60 in left eye).

The ascent in HR after addition of gadget was most elevated in ETT group (99.2±8.39) trailed by C-LMA group (87.75±10.35) and basically no ascent in I-GELgroup (81.4+11.81)

The ascent in SBP after addition of gadget contrasted with after acceptance esteems (108.1+9.71, 107.17+9.14, 108.05+7.23 for I-GEL, C-LMA and ETT separately) was most noteworthy in ETT group (130.57±8.16) trailed by old style LMA group (117.95±7.39) (which didn't transcend pre enlistment esteem) and practically no ascent in IGEL group (108.77+9.10) [p value<0.001] .

The ascent in DBP after inclusion of gadget contrasted with after acceptance esteems (69.22+9.82, 66.87+9.65, 69.12+9.72 for I-GEL, C-LMA and ETT individually) was most elevated in ETT group (84.52±11.78) trailed by LMA group (79.27±7.31) (which didn't transcend pre enlistment esteem) and basically no ascent in I-GEL group (69.8+10.01) [p value<0.001].

In a comparable report by Ismail et al [Ismail et al., 2011] they found that addition of the I-gel didn't build IOP. Addition of an endotracheal tube expanded IOP from 11.6 ± 1.6 to 16.5 ± 1.7 mmHg ($p< 0.001$). The post-inclusion IOP surpassed the pre-acceptance esteem ($p< 0.05$). Addition of the LMA expanded IOP from 13.0 ± 1.5 to 14.7 ± 1.8 mmHg ($p< 0.01$), yet this didn't surpass the pre-acceptance esteem. Tracheal intubation essentially expanded

HR, SBP and DBP. Addition of the LMA essentially expanded HR and SBP. These increments were altogether higher than those which followed addition of the I-gel gadget.

In another examination led by Garima Agarwal et al[Agrawal et al., 2012] they thought about ascent in pulse, mean blood vessel weight and IOP in pediatric patients after utilization of Proseal LMA(P-LMA) and tracheal cylinder. They detailed that there was essentially skyscraper in pulse and mean blood vessel pressure from standard in pediatric patients with utilization of LMA and tracheal cylinder. There was critical increment in pulse and circulatory strain in tracheal cylinder bunch contrasted with P-LMA group of patients. In their examination there was no huge contrast in the pulse (P =0.476), mean circulatory strain (P = 0.578), and IOP (P= 0.998) before addition of the aviation route gadget between the two groups. Following addition of endotracheal tube, there was an exceptionally noteworthy ascent in pulse (P <0.001), mean circulatory strain (P < 0.001), and IOP (P< 0.001). In spite of the fact that there was no noteworthy ascent in the pulse (P = 0.921) and mean circulatory strain (P = 0.327), there was a critical ascent in IOP (P = 0.007) in bunch P-LMA after addition. The rate change in pulse and mean circulatory strain when analyzed between the two groups was seen as huge and exceptionally critical, separately.

In our examination likewise endotracheal tube inclusion indicated huge ascent in pulse and circulatory strain and intraocular pressure which was less in LMA group. Notwithstanding this we additionally contemplated the reaction to I-GEL inclusion, which indicated no ascent at all in IOP, HR, SBP and DBP.

In another examination led by Maharajan [Maharjan, 2012], they have analyzed haemodynamic factors of I-gel and laryngeal cover aviation route with tracheal intubation during laparoscopic medical procedure. In their investigation there was increment in mean pulse after utilization of aviation route gadget in every one of the three groups however greatest with tracheal cylinder and least with I-gel. While basal pulse and pulse preceding aviation route situation were practically identical among every one of the three groups, there was huge distinction among the groups following one moment of utilization of aviation route gadget (p esteem <0.001). Pulse augmentation was likewise there following three and five minutes of aviation route control however the distinction among three groups was factually not critical. Systolic pulse (SBP) addition was additionally most extreme with tracheal intubation, moderate with LMA and least with I-gel. Here again beginning with comparative standard and preceding position readings, there was profoundly critical contrast in SBP among the groups following one moment of aviation route arrangement (p = 0.002). Correlations of systolic circulatory strain in other time stretches in three groups were factually not huge. Concerning pulse, there was noteworthy distinction in one moment after inclusion (p = 0.019) yet no huge contrast identified in other time spans contemplated.

Our investigation additionally demonstrated comparative outcomes with the exception of that the ascent in HR, SBP, DBP considerably after 5 min were altogether higher measurably in ETT and LMA group (albeit diminished from soon after inclusion esteems) when contrasted with I-GEL group. This may be a result of the utilization of Inj.

propofol as the acceptance specialist when contrasted with Inj. thiopentone utilized by us. Likewise we have looked at intraocular pressure as one of the boundaries.

Jindal P et al[Jindal et al., 2009] thought about haemodynamic impacts of three supraglottic aviation route gadgets I-gel, LMA and smoothed out pharyngeal aviation route (SLIPA) which is likewise a supraglottic aviation route without inflatable sleeve during general sedation with muscle unwinding. In their examination they found that there was no noteworthy change in pulse in bunch I-gel and in bunch SLIPA whenever. On contrasting group I-gel with bunch LMA there were critical changes in HR post addition till 5 min. In each of the three groups, there was critical distinction in systolic circulatory strain and diastolic pulse from inclusion of gadget till 5 min after addition.

In our investigation we have utilized endotracheal tube which shows the most noteworthy ascent in HR, SBP and DBP. Correlation among LMA and I-GEL indicated results like this examination.

Montazari K [Montazari et al., 2004] looked at haemodynamic changes after utilization of facemask, LMA and tracheal cylinder. In their investigation, contrasted and preinduction and preinsertion esteems, changes in HR and MAP esteems saw during 15 minutes after acceptance of general sedation were factually noteworthy in all groups and the LMA bunch had a fundamentally lower, then the most extreme mean changes in SBP, DBP and HR were increasingly set apart after ETT (SBP 15% ± 11%, DBP 10% ± 13%, HR 17% ± 19%) and FM (SBP 12% ± 8%, DBP 6% ± 11%, HR 13% ± 7%) than addition of LMA (SBP – 3% ± 13%, DBP – 5% ± 16%, HR 4% ± 13%) ($P<0.005$, $P <0.005$ and $P<0.01$ for SBP and DBP and HR, individually).

Our examination likewise uncovers less haemodynamic reaction by LMA addition in contrast with ETT inclusion. Likewise we have contemplated reaction after I-GEL addition alongside them, which shows significantly lesser reaction than LMA.

In an investigation directed by Holden [Holden et al., 1991] they have thought about intra-visual weight changes and cardiovascular changes utilizing the laryngeal cover aviation route and tracheal cylinder. In their examination the mean change (SD) in IOP during aviation route arrangement contrasted with pattern was +1.8(2.1) in LMA group and +6.8(5.5) in tracheal cylinder group ($p<0.0001$). The mean change (SD) in HR during aviation route position contrasted with standard was +3.1 (10.2) in LMA group and +15.3 (14.3) in tracheal cylinder group ($p<0.01$). The mean change (SD) in SBP during aviation route position contrasted with pattern was +2 (21.5) in LMA group and +16 (34.4) in tracheal cylinder group (p not noteworthy). The mean change (SD) in DBP during aviation route position contrasted with benchmark was +8.6 (6) in LMA group and +7.8(6) in tracheal cylinder group (p not critical).

In our investigation the IOP and HR expanded with the tracheal group as in this examination, anyway our examination additionally indicated critical increment in SBP and DBP which is conflicting with this examination. The

BP readings were not prompt and despite the fact that there was not a noteworthy contrast between the two groups with respect to the BP, the pattern was for the systolic BP to be higher in the tracheal cylinder group. This absence of importance may have been because of the way that the BP checking was not consistent.

V. Conclusion

We thus conclude, that in a detailed investigation of 120 patients, inclusion of I-gel indicated minimal ascent in IOP and haemodynamic boundaries, when contrasted with the CLMA and ETT addition.

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